# GLOSSARY

## TERMS

Absorption: Penetration of a substance into the body of another.

Accuracy: The ratio of the difference between the approximate solution obtained using a numerical model and the exact solution of the governing equations, divided by the exact solution.

Adjustment: Variation of the parameters in a model to ensure a close reproduction by the model of a set of prototype conditions.

Adsorption: The concentration of gases, dissolved materials, or ions on the surface of solid particles.

Aeration: A process in which water is treated with air or other gases, usually oxygen. In lake restoration, aeration is used to prevent anaerobic conditions or to provide artificial destratification.

Aerobic: Living or active only in the presence of oxygen.

Algal bloom: A high concentration of a specific algal species in a water body, usually caused by nutrient enrichment.

Algorithm: A set of numerical steps or routines to obtain a numerical output from a numerical input.

Alkalinity: A quantitative measure of water's capacity to neutralize acids. Alkalinity results from the presence of bicarbonates, carbonates, hydroxides, salts, and occasionally borates, silicates, and phosphates. Numerically, it is expressed as the concentration of calcium carbonate that has an equivalent capacity to neutralize strong acids.

Allochthonous: Describes organic matter produced outside of a specific stream or lake system.

Alluvial: Pertaining to sediments gradually deposited by moving water.

Anaerobic: Living, active, or occurring in the absence of free oxygen.

Analytical model: Mathematical model in which the solution of the governing equations is obtained by mathematical analysis, as opposed to numerical manipulation.

Anoxic: Devoid of free oxygen.

Aquifer: (1) A wholly saturated water-bearing stratum or zone of permeable rock below the surface of the earth capable of producing water from a well;

(2) Stratum or zone below the surface of the earth capable of producing water as from a well.

Autochthonous: Any organic matter indigenous to a specific stream or lake.

Autotrophic: The ability to synthesize organic matter from inorganic substances.

Basin: (1) Drainage area of lake or stream, such as a river basin; (2) Naturally or artifically enclosed harbor for a small craft, such as a turning basin for tows, or a yacht basin.

Benthic oxygen demand: Oxygen demand exerted from the bottom of a stream or lake, usually by biochemical oxidation of organic material in the sediments.

Benthos: Organisms living on or in the bottom of a body of water.

Bioassay: The use of living organisms to determine the biological effect of some substance, factor, or condition.

Biochemical oxidation: The process by which bacteria and other microorganisms break down organic material and remove organic matter from solution.

Biochemical oxygen demand (BOD): The amount of oxygen used by aerobic organisms to decompose organic material. Provides an indirect measure of the concentration of biologically degradable material present in water or wastewater.

Biomass: The total mass of living organisms in a particular volume or area.

Biome: A major kind of community, conceived in terms of form and structure of its plant and animal constituents.

Biota: All living matter in a particular region.

Blue-green algae: The phylum Cyanophyta, characterized by the presence of blue pigment in addition to green chlorophyll, which generally creates water quality concerns.

Boundary conditions (numerical models): Definition or statement of conditions or phenomena occurring at the boundaries of the model.

Boundary conditions (physical models): Conditions entered at the spatial boundaries of the model.

Calibration: Process of checking, adjusting, or standardizing operating characteristics of instruments and model appurtenances on a physical model or coefficients in a mathematical model. The process of evaluating the scale readings of an instrument in terms of the physical quantity to be measured.

Catchment: Surface drainage area.

Chemocline: A stratum of stronger concentration gradient of dissolved substances.

Chlorophyll: Green pigment in plants and algae necessary for photosynthesis.

Circulation period: The interval of time in which the thermal stratification of a lake is destroyed, resulting in the mixing of the entire water body.

Clinograde: The stratification curve of temperature or of a chemical substance in water that exhibits a uniform slope from the surface into deep water.

Conceptual model: Simplification of prototype behavior used to demonstrate concepts.

Convergence: State of tending to a unique solution. A given scheme is convergent if an increasingly finer computational grid leads to a more accurate approximation of the unique solution. Note that a numerical method may sometimes converge on a wrong solution.

Dam: Barrier constructed across a valley for impounding water or creating a reservoir, usually with facilities to control the release of impounded waters.

Densimetric Froude number: The ratio of inertial to buoyancy forces in a stratified system.

Denitrification: Reduction from nitrate to nitrite and further to elemental nitrogen.

Densimetric Froude number model: Model of gravity-dominated flow usually being densimetric Froude number scaling. Buoyant jets and stratified flows are examples.

Deterministic model: Mathematical model in which the behavior of every variable is completely determined by the governing equations.

Detritus: Finely divided organic or inorganic settleable material suspended in the water.

Dimensional analysis: Derivation of dimensionless ratios, based on the fact that functional relationships (for both model and prototype) must be dimensionally homogeneous.

Dimensionless number: Physically meaningful ratio of parameters that is dimensionless. These dimensionless ratios are useful in determining scaling laws since a particular dimensionless number must be the same in model and

prototype to achieve similarity. Examples are the common force ratios, such as Froude and Reynolds numbers.

Dissolved solids: The difference between the total and suspended solids in water.

Distorted model: Hydraulic model in which horizontal and vertical scales are different.

Diversion: A channel or berm constructed across or at the bottom of a slope for the purpose of intercepting surface runoff.

Drainage basin, watershed, drainage area: A geographical area where surface runoff from streams and other natural watercourses is carried by a single drainage system to a common outlet.

Dynamic model: A mathematical model in which time is included as an independent variable.

Empirical model: Representation of a real system by a mathematical description based on experimental data rather than on general physical laws.

Enrichment: The addition to or accumulation of plant nutrients in water.

Epilimnion: The upper, circulating layer of a thermally stratified lake.

Erosion: The process by which the soil particles in situ are detached and transported by water or wind action and gravity to some downslope or downstream deposition point.

Eutrophic: Waters with a good supply of nutrients and hence a rich organic production.

Eutrophication: A natural enrichment process of a lake, which may be accelerated by man's activities. Usually manifested by one or more of the following characteristics: (1) excessive biomass accumulations or primary producers, (2) rapid organic and/or inorganic sedimentation and shallowing, or (3) seasonal and/or diurnal dissolved oxygen deficiencies.

Flood capacity: The flow carried by a stream or floodway at bankfull water level. Also, the storage capacity of the flood pool at a reservoir.

Froude number: Dimensionless number relating the velocity of flow to the speed of propagation of a small disturbance; the ratio of inertial forces to gravitational forces.

Gaging station: A selected section of a stream channel equipped with a gage, recorder, and/or other facilities for determining stream discharge.

Green algae: Algae characterized by the presence of photosynthetic pigments similar in color to those of the higher green plant.

Headwaters: (1) Upper reaches of stream near its source; (2) Region where ground waters emerge to form a surface stream; (3) Water upstream from a structure.

Heavy metals: Metals of high specific gravity, including cadmium, chromium, cobalt, copper, lead, mercury. These are toxic to many organisms, even in low concentrations.

Herbicide: Any chemical substance or mixture of substances intended to prevent, destroy, repel, or mitigate the growth of any tree, bush, weed, algae, and other aquatic needs.

Heterograde: A curve for temperature or a chemical factor in a body of water that exhibits a nonuniform slope from the surface downward into deep water.

Heterotrophic: The nutrition of plants and animals that are dependent on organic matter for food.

Heuristic model: Representation of a real system by a mathematical description based on reasoned, but unproven argument.

Holomictic: Lakes that are completely circulated to the bottom at the time of winter cooling.

Hydraulic model: Physical model using water as fluid.

Hydroelectric: Producing or relating to the production of electricity by water power.

Hydrograph: A continuous graph showing the properties of streamflow with respect to time.

Hydrologic cycle: The movement of water from the oceans to the atmosphere and back to the sea. Many subcycles exist, including precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration.

Hydrology: Science dealing with the occurrence, circulation, distribution, and properties of the waters of the earth and its atmosphere.

Hypolimnion: The deep layer of a lake lying below the metaliminion and removed from surface influences.

Infiltration: Water entering the ground-water system throughout the land surface.

Initial conditions: Given values of dependent variables or relationship between dependent and independent variables at the time of startup of the computation.

Interactive model: Numerical model that allows interaction by the modeler during computation.

Laboratory effect: Consequence of necessary laboratory simplifications or physical constraints on the model.

Limiting nutrient: The substance that is limiting to biological growth due to its short supply with respect to other substances necessary for the growth of an organism.

Limnology: The study of inland waters.

Linear model: Mathematical model based entirely on linear equations.

Littoral: The shoreward region of a body of water.

Lock: Enclosed part of a waterway equipped with gates that allow water levels to change in order to raise or lower boats.

Macrophytes: Large vascular aquatic plants that are either rooted or floating.

Mathematical model: Model using mathematical relationships to represent the prototype.

Meromictic lakes: Those lakes that at the time of winter cooling undergo only a partial circulation down to a depth determined by a density stratification.

Mesotrophic lake: A trophic condition between an oligotrophic and an eutrophic water body.

Metalimnion: The layer of water in a lake between the epilimnion and hypolimnion in which the temperature exhibits the greatest difference in a vertical direction.

Monimolimnion: The deep water of a meromictic lake that is not involved in the annual circulation.

Monte Carlo method: Technique of stochastic sampling or selection of random numbers to generate synthetic data.

Net production: The assimilation surplus in a given period of time after subtracting the amount of dissimilation in the same time interval.

Neutralization: The process of adding an acidic or alkaline material to wastewater and/or surface water runoff to adjust its pH to a neutral condition.

Nitrification: The biochemical oxidation process by which ammonia is changed first to nitrites and then to nitrates by bacterial action.

Nitrogen, available: Includes ammonium, nitrate ions, ammonia, and certain simple amines readily available for plant growth.

Nitrogen cycle: The sequence of biochemical changes in which atmospheric nitrogen is "fixed," then used by a living organism, liberated upon the death and decomposition of the organism, and reduced to its original state.

Nitrogen, fixation: The biological process of removing elemental nitrogen from the atmosphere and incorporating it into organic compounds.

Nitrogen, organic: Nitrogen components of biological origin such as amino acids, proteins, and peptides.

Nonlinear model: Mathematical model using one or more nonlinear equations.

Nonpoint source: Pollutants that are not traceable to a discrete origin, but generally result from land runoff, precipitation, drainage, or seepage.

Numerical model: Mathematical model in which the governing equations are not solved analytically. Using discrete numerical values to represent the variable involved and using arithmetic operations. The governing equations are solved approximately.

Nutrient, available: That portion of an element or compound that can be readily absorbed and assimilated by growing plants.

Oligotrophic lake: A lake with a small supply of nutrients, and consequently a low level of primary production.

One-dimensional model: Model defined on one space coordinate, i.e., variables are averaged over the other two directions, e.g., pipe flow models and numerical models of long wave propagation in a narrow channel.

Orthograde: A stratification curve for temperature or a chemical factor in a body of water that has a straight uniform course.

Orthophosphate: See phosphorus, available.

Outfall: The point where wastewater or drainage discharges from a sewer to a receiving body of water.

Overturn: The complete mixing of a previously thermally stratified lake. This occurs in the spring and fall when water temperatures in the lake are uniform.

Oxidation: The removal of electrons from an ion or atom.

Oxygen deficit: The difference between observed oxygen concentrations and the amount that would be present at 100-percent saturation at a specific temperature.

Peak discharge: The maximum instantaneous flow from a given storm condition at a specific location.

Penstock: Conduit for controlling flow of water through a structure.

Periphyton: Microorganisms that are attached to or growing on submerged surfaces in water.

Pesticides: Any herbicide, insecticide, or rodenticide, excluding those nontoxic repellents or other chemicals.

Phosphorus, available: Phosphorus that is readily available for plant growth. Usually in the form of soluble orthophosphates.

Phosphorus, total (TP): All of the phosphorus present in a sample regardless of form. Usually measured by the persulfate digestion procedure.

Physical model: Model using the physical properties and behavior of modeling materials to represent the prototype.

Photosynthesis: The process occurring in green plants in which light energy is used to convert inorganic compounds to carbohydrates. In this process, carbon dioxide is consumed and oxygen is released.

Phytoplankton: Plant microorganisms, such as algae, living unattached in the water.

Plankton: Unattached aquatic microorganisms that drift passively through water.

Point source: Any discernible, confined, and discrete pipe, channel, ditch, tunnel, conduit, well, discrete fissure, or container that discharges or releases pollutants into water.

Population equivalent: An expression of the amount of a given waste load in terms of the size of human population that would contribute the same amount of biochemical oxygen demand per day.

Primary production: The production of organic matter from light energy and inorganic materials, by autotrophic organisms.

Probabilistic model: Mathematical model in which the behavior or one or more of the variables is either completely or partially described by equations of probability.

Project flood: A hypothetical flood selected as the guide for determining the size of engineering features of a project, such as levee height, floodway width, channel and storage size.

Prototype: The full-sized structure, system process, or phenomenon being modeled.

Reduction: The gaining of electrons.

Regulating: Reducing fluctuations of the outflow of water from an upstream project to smooth the flow and make it more uniform and even.

Reservoir: Pond, lake, basin, or other space, either natural or created in whole or in part by building of a structure such as a dam, that is used for storage, regulation, and control of water for power navigation, recreation, etc.

Reynolds number: Dimensionless ratio of inertial forces to viscous forces.

River basin: A portion of a water resource region, defined by a hydrological boundary.

Runoff: That part of precipitation that flows over the land surface from the area upon which it falls.

Scale: Ratio of a variable in a model to the corresponding variable in the prototype.

Scouring: The clearing and digging action of flowing water, especially the downward erosion caused by stream water in sweeping away mud and silt, usually during a flood.

Secchi depth: A measure of optical water clarity as determined by lowering a weighted Secchi disk into a water body to the point where it is no longer visible.

Sediment basin: A structure designed to slow the velocity of runoff water and facilitate the settling and retention of sediment and debris.

Seiche: A standing wave in a lake.

Similarity: Correspondence between the behavior of a model and its prototype.

Simulation: Replication of the prototype using a model.

Simulation model: Mathematical model that is used with actual or synthetic input data, or both, to produce long-term time series or predictions.

Specific gravity: A ratio that denotes how many times heavier a body is than the same volume of water at 4° C.

Specific heat: The quantity of heat in calories that must be added to a unit weight of a substance in order to raise its temperature 1° C.

Stability (numerical or computational): Ability of a scheme to control the propagation or growth of small perturbations introduced in the calculations.

Stage: Elevation of water surface above or below an arbitrary figure.

Standing crop: The biomass present in a body of water at a particular time.

Steady-state model: Model in which the variables being investigated are independent of time.

Stochastic model: See probabilistic model.

Subbasin: A physical division of a larger basin, associated with one reach of the storm drainage system.

Substrate: The substance or base upon which an organism grows.

Suspended solids: refers to the particulate matter in a sample, including the material that remains dispersed.

Thermal stratification: The layering of water bodies due to temperature-induced density differences.

Thermocline: The plane with the maximum rate of change in temperation or inflection in the temperature curve through the metalimnion.

Three-dimensional model: Model defined on three space coordinates, e.g., coastal models and numerical models of explosions.

Total solids: The solids in water, sewage, or other liquids, including the dissolved, filterable, and nonfilterable solids. The residue left when a sample is evaporated and dried at a specified temperature.

Trace elements: Those elements that are needed in low concentrations for the growth of an organism.

Tributary: Stream or other body of water that contributes its water to another stream or body of water.

Trophic condition: A relative description of a lake's biological productivity. The range of trophic conditions is characterized by the terms oligotrophic for the least biologically productive, to eutrophic for the most biologically productive.

Turbidity: A measure of the cloudiness of a liquid. Turbidity provides an indirect measure of the suspended solids concentration in water.

Turbulence: Unorganized movement in liquids and gases resulting from eddy formation.

Two-dimensional model: Model defined on two space coordinates, i.e., variables are averaged over the third direction (e.g., wave flume experiments, numerical models of storm surges).

Unsteady-state model: Model in which the variables being investigated are time dependent.

Validation: Comparison of model results with a set of prototype data not used for verification. Comparison includes: (1) using a data set very similar to the verification data to determine the validity of the model under conditions for which it was designed; (2) using a data set quite different from the verification data to determine the validity of the model under conditions for which it was not designed but could possibly be used; (3) using postconstruction prototype data to determine the validity of the predictions based on model results.

Verification: Check of the behavior of an adjustment model against a set of prototype conditions.

Viscosity: Resistance to flow in a liquid.

Water quality: A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Water quality standards: State-enforced standards describing the required physical and chemical properties of water according to its designated uses.

Watershed: See drainage basin.

Zooplankton: Protozoa and other animal microorganisms living unattached in water.